Hall Ticket Number:

CE413(CEEL13) (R20)

B.TECH. DEGREE EXAMINATION, DECEMBER-2024

Semester VII [Fourth Year] (Regular & Supplementary)

DESIGN OF STEEL STRUCTURES

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

(a)	List the different elements of a welded plate girder.	CO1
(b)	List the various steps involved in design of gantry girder.	CO1
(c)	Difference between stiffened and unstiffened seat angle connection.	CO1
(d)	What is the function of stiffners?	CO1
(e)	What is the difference between beam and plate girder.	CO2
(f)	What are the various types of plate girder?	CO2
(g)	What is the economic range of spacing of truss?	CO3
(h)	Define purlins.	CO3
(i)	List the different profiles of cross sections which are used for gantry girders.	CO3
(j)	List the type of sections used for light gauge sections.	CO4
(k)	Distinguish between determinate and indeterminate trusses.	CO4
(l)	What is the function of a bracing?	CO4
(m)	Where are plate girders used?	CO4
(n)	Write the expressions for calculating tensile capacity of plate due to gross yielding and net rupture.	CO4

UNIT – I

2. A 50 kN hand-operated crane is provided in a building and has the following data:

Centre to centre distance of the gantry beam:	16 m
Longitudinal spacing of columns:	7.5 m
Weight of the crane:	40 kN
Wheel spacing:	3 m
Weight of the crab:	10 kN
Minimum hook approach:	1 m
Yield stress of steel:	250 MPa

Design a simply supported gantry girder assuming lateral support to it. CO1

(OR)

3. Design a welded plate girder for a simply supported brige deck beam with a clear span of 20 m, subjected to the following:
Dead load including Self weight: 20 kN/m
Impose Load: 10 kN/m
Assume that the top compression flange of the plate girder is restrained laterally and prevented from rotating. Use mild steel (f_y = 250 MPa). Design as an unsupported plate girder with thick webs. CO1

UNIT – II

4. Design a welded seat angle connection between a beam ISMB300 and a column ISHB200 for a reaction of beam 100 kN, assuming Fe410 Grade steel and site welding. CO2

(OR)

5. Design a flange angle connection using bolts of grade 4.6 to transfer a factored moment of 12 kNm and a shear force of 150 kN from a beam of ISMB350 to a column of ISHB300. CO2

UNIT – III

6. Design a principal rafter of a fink type roof truss for the following data. Design also its connection using 20 mm diameter bolts. CO3

Design Compressive load:	165 kN (due to D.L. and L.L.)
Design Tensile load:	60 kN(due to D.L and W.L)
Length of rafter Panel:	2.235 m
Grade of Steel:	Fe 410
Grade of Bolts:	4.6

(OR)

7. Design a roof truss for a railway platform 30 m x 12 m wide. The roofing is to be done with asbestos sheets. Basic wind speed is 50 m/s and the terrain is open industrial area, building is class a building with a clear height of 4.2 m at eaves. CO3

UNIT – IV

8. A square box of 180 mm x 180 mm x 2 mm is used as a column of 4 m effective length, it is stiffened on all four sides. Find the maximum load it can carry. Design also the stiffener if required, Take f_y = 235 MPa. CO4

(OR)

9. (a) Write a short note on: (7M) CO4
   (i) Limit state of collapse
   (ii) Limit state of serviceability
   (iii) Deflection
   (b) Write a short note on: (7M) CO4
   (i) Composite beam
   (ii) Method of construction of composite beam
   (iii) Principle of composite action
   (iv) Shear connectors and their types

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Hall Ticket Number:

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Semester VII [Fourth Year] (Regular)

DESIGN OF STEEL STRUCTURES

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

(a)	Define web buckling and crippling.	CO1
(b)	Differentiate Gantry girder and plate girder.	CO1
(c)	What is the function of stiffeners?	CO1
(d)	Write the difference between simple beam and moment resistance connection.	CO2
(e)	Mention different types of stiffeners need to be designed for plate girder.	CO2
(f)	Write the advantages of welded connection over bolted connection.	CO2
(g)	How live loads are considered in roof truss.	CO3
(h)	How spacing of purlins fixed?	CO3
(i)	Mention advantages of roof truss over regular buildings.	CO3
(j)	What is the design concept of end bearing?	CO4
(k)	Define stiffened elements in light gauge steel sections.	CO4
(l)	Write the methods used for composite construction.	CO4
(m)	Define the terms limit state of collapse and limit state of serviceability.	CO4
(n)	What are the various types of sections used for light gauge sections?	CO4

UNIT – I

2. Design a simply supported gantry girder of effective span 5 m to carry a crane of capacity 110 kN. The weight of the crane excluding the crab is 135 kN and the weight of the crab is 30 kN. The weight of the rail is 280 N/m. The minimum approach of the crane hook is 1.0 m. The wheel base is 4 m. The centre to centre distance between the gantry girder is 16 m. The height of the rail is 80 mm. Assume that the gantry girder is laterally unsupported. CO1

(OR)

3. Design a welded plate girder for a laterally supported simply supported span of 25 m to carry a Uniformly Distributed Load of 50 kN/m excluding its own weight. CO1

UNIT – II

4. Design a stiffened seat angle bolted connection for a reaction of 300 kN on a beam ISMB 400 which is connected to a column ISHB 200. Detail the joint and design the bolts. CO2

(OR)

5. Design a web angle connection for a beam ISMB 400 @ 61.5 kg/m which transfers a factored end shear of 80 kN to the flange of the column ISHB 300 @ 63 kg/m use welded connection. CO2

UNIT – III

6. Design a channel section purlin member of an industrial roof truss of factory shed located in open land in Chennai for the following data:
Span of the truss = 20 m
Length of the shed = 40 m
Height of the eve from ground = 8 m

Roof angle = 12°
c/c spacing of the purlin = 1.20 m
weight of roof covering material = 60 N/mm^2
Design the purlin for the critical load combination and apply the checks. CO3

(OR)

7. (a) What are the loads to be considered in the design of steel roof truss explain in detail (7M) CO3
(b) Draw a neat sketch of a roof truss and name the components and explain function of each component. (7M) CO3

UNIT – IV

8. A light gauge steel rectangular box section 200 mm x 150 mm x 3 mm is used for a column. The effective length of column is 3.5 m. Determine the safe load carrying capacity of the section, basic design stress is 125 N/mm^2. CO4

(OR)

9. Design a composite beam with rigid shear connectors, assume effective span of the beam 10 m and total load is 60 kN/m including self weight. Use M40 grade concrete. CO4

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